TABLE 2.—*Free-air resultant winds (m. p. s.) during September, 1928*

Altitude m. s. l.	Broken Arrow, Okla. (233 meters)				Due West, S. C. (217 meters)				Ellendale, N. Dak. (444 meters)				Groesbeck, Tex. (141 meters)				Royal Center, Ind. (225 meters)				Washington, D. C. (34 meters)			
	Mean		Normal		Mean		Normal		Mean		Normal		Mean		Normal		Mean		Normal		Mean		Normal	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
Meters	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	S. 22 E.	1.6	S. 2 E.	3.2	N. 68 E.	1.0	N. 59 E.	2.6	N. 64 W.	2.6	N. 71 W.	0.6	N. 68 E.	1.6	S. 24 E.	1.7	S. 66 W.	1.8	S. 45 W.	1.4	N. 60 W.	0.7	N. 7 W.	0.7
250	S. 27 E.	1.9	S. 2 E.	3.3	N. 65 E.	0.9	N. 58 E.	2.5					N. 78 E.	2.8	S. 24 E.	2.4	S. 70 W.	2.0	S. 45 W.	1.6	N. 58 W.	2.3	N. 25 W.	1.1
500	S. 14 E.	2.5	S. 7 W.	4.5	N. 54 E.	0.5	N. 53 E.	2.7	N. 68 W.	2.7	S. 81 W.	0.7	E.	3.8	S. 15 E.	3.7	S. 81 W.	3.8	S. 50 W.	3.4	N. 50 W.	2.7	N. 36 W.	1.8
750	S. 9 W.	2.5	S. 14 W.	5.3	S. 16 W.	0.4	N. 61 E.	3.1	N. 72 W.	3.0	S. 61 W.	1.3	N. 81 E.	3.1	S. 7 E.	4.0	S. 82 W.	5.0	S. 58 W.	4.4	N. 50 W.	3.5	N. 40 W.	1.7
1,000	S. 34 W.	2.7	S. 24 W.	5.2	S. 30 W.	1.8	N. 67 E.	2.8	N. 69 W.	3.4	S. 63 W.	1.8	N. 65 E.	2.7	S. 4 E.	4.2	N. 88 W.	5.5	S. 66 W.	5.1	N. 51 W.	3.8	N. 44 W.	2.7
1,250	S. 67 W.	2.5	S. 30 W.	5.0	S. 58 W.	2.7	N. 53 E.	2.7	N. 73 W.	4.1	S. 64 W.	2.6	N. 60 E.	2.8	S. 3 E.	4.3	N. 89 W.	6.0	S. 69 W.	6.2				
1,500	S. 72 W.	3.0	S. 39 W.	5.0	S. 76 W.	4.2	N. 53 E.	2.0	N. 71 W.	4.6	S. 71 W.	3.4	N. 47 E.	3.8	S. 3 E.	4.2	S. 87 W.	7.1	S. 73 W.	6.8	N. 57 W.	6.6	N. 54 W.	4.4
2,000	S. 86 W.	4.0	S. 46 W.	5.7	S. 29 W.	2.0	N. 63 E.	1.8	N. 67 W.	6.0	S. 77 W.	4.8	N. 48 E.	4.2	S. 3 E.	3.8	N. 86 W.	8.2	S. 75 W.	8.5	N. 72 W.	7.9	N. 68 W.	5.7
2,500	S. 86 W.	4.2	S. 53 W.	5.4	S. 77 W.	7.5	N. 42 E.	0.9	N. 70 W.	7.2	S. 81 W.	6.7	N. 37 E.	3.8	S. 5 E.	3.7	N. 87 W.	9.7	S. 75 W.	10.2	N. 82 W.	8.7	N. 72 W.	6.5
3,000	W.	5.3	S. 51 W.	6.2	N. 83 W.	9.6	N. 41 W.	0.9	N. 67 W.	9.0	S. 87 W.	8.9	N. 20 E.	4.4	S. 3 E.	3.6	N. 88 W.	10.1	S. 74 W.	12.4	N. 79 W.	11.4	N. 71 W.	6.8
3,500	S. 68 W.	6.3	S. 53 W.	6.3	N. 77 W.	10.4	N. 1 E.	2.1	N. 57 W.	14.0	W.	10.7	N. 34 E.	5.5	S. 4 E.	2.7	N. 84 W.	8.5	S. 79 W.	11.8	N. 70 W.	10.4	N. 68 W.	7.4
4,000	S. 75 W.	7.2	S. 69 W.	7.5	N. 67 W.	12.0	N. 29 W.	3.9	N. 44 W.	15.8	N. 81 W.	12.0	N. 38 E.	5.4	S. 4 E.	2.8	N. 88 W.	8.5	S. 86 W.	10.5	N. 83 W.	14.7	N. 72 W.	8.4
4,500	S. 80 W.	6.6	S. 87 W.	8.8	N. 67 W.	14.0	N. 38 W.	8.4	N. 45 W.	14.0	N. 80 W.	13.1					N. 53 W.	9.3	N. 82 W.	9.0	S. 89 W.	10.1	N. 69 W.	8.0
5,000									N. 45 W.	14.0	N. 85 W.	14.5					N. 45 W.	18.0	N. 45 W.	18.0	N. 70 W.	8.9	N. 71 W.	7.8

WEATHER IN THE UNITED STATES

THE WEATHER ELEMENTS

By P. C. DAY

GENERAL CONDITIONS

The outstanding feature of the weather history of September, 1928, was that pertaining to the severe tropical hurricane that entered southeastern Florida near Palm Beach during the early evening of September 16, the full details of which appear elsewhere in this issue. This storm was among the most severe in the history of the Southern States, rivaling that occurring in the vicinity of Miami, Fla., September, 1926, in property damage, and greatly exceeding it in the number of deaths, mostly by drowning. Aside from the above the month was notably cool over the eastern two-thirds of the country, and there was a widespread deficiency in precipitation.

PRESSURE AND WINDS

The early days of the month showed moderately high pressure over most western districts and from the Ohio Valley northeastward to New England, with local precipitation over most Southern States from Texas northeastward to the middle Atlantic coast, some heavy falls being reported in this area. By the morning of the 3d precipitation had overspread the upper Mississippi Valley and upper Lake region, extending during the 4th into New England and the adjacent Canadian Provinces. During this period fair weather prevailed in nearly all central and western districts and, save for local rains along the south and middle Atlantic coasts from about the 5th to 7th, fair weather continued until near the end of the first decade in all parts of the country.

By the morning of the 10th cyclonic conditions had developed over the middle Great Plains and moderate to heavy precipitation occurred over considerable areas during the following three or four days from Texas northeastward to the Great Lakes and northern New England and westward over the upper Mississippi Valley into the Dakotas and adjacent Canadian Provinces. Immediately following this rain area a cyclone of moderate intensity advanced from British Columbia southeastward, reaching the lower Missouri Valley by the morning of the 14th when rain was falling over an extensive area. This cyclone moved northeastward to the upper Lakes by the following morning and precipitation became rather general southward to the lower Ohio Valley and eastward to the lower Lakes and over much of the Province of Ontario.

Following this, anticyclonic conditions overspread most western and northern districts, continuing for several days. In the meantime, however, a strong tropical hurricane had developed over the eastern portion of the West Indies and passed directly across the island of Porto Rico during the afternoon and night of the 13th doing immense damage to property and causing large loss of life as elsewhere shown in this REVIEW.

The generally fair weather prevailing over most of the country during and preceding the last-mentioned storm was largely terminated about the beginning of the third decade when cyclonic conditions developed in the middle Plains and by the morning of the 21st low pressure was central over the upper Lakes and light rains had fallen from Colorado northeastward to the Lake Superior region. During the following 24 hours the cyclone moved northeastward and rain occurred from the Lake region to northern New England. At the same time low pressure had developed over the lower Rio Grande Valley and heavy rains had occureed in southern Texas, extending during the 23d and 24th into the southern portions of the Gulf and South Atlantic States, and continuing over the more eastern portions of that area during the following 24 hours.

The latter part of the month continued mostly fair in the central and western portions, but in the more eastern sections local showers occurred along the Gulf coast and in portions of the Ohio Valley and Eastern States

In the far West precipitation was mainly absent until the 12th to 15th when showers, mostly light, overspread local areas from central California and portions of Nevada northward.

The sea-level pressure for the month as a whole was above normal over the central valleys and Rocky Mountains where anticyclonic conditions existed during much of the month, and it was less than normal over most eastern districts and locally in the far West.

The general distribution of the average pressure and the variations from the means of the preceding month, and the prevailing directions of the winds are shown on the various charts, while the details of the severe wind and other storms are shown in the table at the end of this section.

TEMPERATURE

The opening decade of September was largely cool in central, southern, and eastern portions, also west of the Cascade Mountains and along most of the northern border, but was warm in the far Southwest and the middle Rocky Mountain region.

The week ending the 18th was a trifle cooler than normal in the north-central portion and parts of the far Northwest, but was mild over most of the country, particularly from the southern Plains northeastward to the Middle Atlantic States.

The final 12 days of the month were mainly warm from the Rocky Mountains westward, but substantially everywhere east of the Rockies were cool for the season, particularly from the central valleys eastward and northeastward to the Middle Atlantic States and New England.

The month averaged warmer than normal in most of the far West, but practically normal on the immediate Pacific coast and likewise in Florida. In Montana and the Plains States and almost everywhere to eastward the month averaged cool, notably from the middle and upper Mississippi Valley eastward to near the Atlantic coast, where the deficiency was mainly 4° or more per day.

No unusually high marks for the season were reported save in portions of California, notably at Eureka, where on the 21st the maximum was the highest of record for September, and at Fresno, where the maximum the same day was the highest so late in autumn. Locally in the far West and generally in the Plains region the highest temperatures were reached during the opening week, but near and to eastward of the Mississippi River they occurred chiefly during the period from the 10th to 15th.

The lowest readings occurred almost always from the 24th to the 28th in the Plains States and to eastward, about the 14th in the far Southwest, about the 9th in the western and northern Plateau districts, and elsewhere on scattered dates.

Killing frosts occurred in many north-central and some central districts during the last week, those at Louisville, Ky., on the 26th and at Peoria, Ill., on the 27th being the earliest known in a period of over 50 years. In general, staple crops were better matured than usual in late September, so the damage was not great.

PRECIPITATION

Over by far the larger part of the country the total rainfall of September was decidedly less than normal; but in the States where the fall was more than normal the excess was often very great. Owing chiefly to notable rains during the first week and to the effects of the hurricane moving northward from the Tropics, just after the middle of the month, most Atlantic Coast States received very heavy rains. The monthly amounts were from two to five times the normal over the eastern halves of the Carolinas and local points had the greatest September precipitation of record. Considerable areas visited by these heavy downpours had already experienced excessive rains in connection with the two severe storms of August, though the region of heaviest rains in September was situated chiefly to eastward of the region where the August downpours were greatest.

The State average of North Carolina was greater than ever before in September, and the South Carolina average very closely approached the previous record. Among individual stations, Marion, S. C., reported the greatest monthly total, 27.06 inches.

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In most counties of New York and Pennsylvania the September rainfall was somewhat scanty, likewise in northern New Jersey and parts of New England.

Outside of the Atlantic States heavy precipitation occurred in extreme southeastern Louisiana and over most of southern Texas. The amount for Corpus Christi was 15.89 inches, making this the wettest September in over 40 years of record. The northern part of the upper Lake region and some portions of the upper Mississippi Valley had more than the normal September precipitation.

In the Ohio Valley and the southern portion of the Lake region, also in most of the Missouri Valley, September was much drier than normal, and particularly was the month dry from central Tennessee and northwestern Alabama westward to northern Texas, Oklahoma, and southern Kansas. In Oklahoma and Arkansas this was the driest September of those for which averages have been computed and a number of points in the Ohio Valley and near-by areas also had the least precipitation of record for September.

Central, eastern, and southern Nevada and the southern half of California were practically without rain, while nearly all other parts of the Pacific, Plateau, and Rocky Mountain regions had much less than the normal quantities.

SNOWFALL

Over a number of scattered districts in the northern third of the country and in a few mountain areas farther south snow occurred, but mainly in trifling amounts.

In southeastern Idaho and southwestern Montana a few inches fell locally, Conway's ranch, in the latter State, reporting the greatest amount, 4.5 inches, on the 12th and 13th.

In northern Michigan, especially the western half of the upper peninsula, rather unusual snowfall for such an early date occurred on the 23d to 25th, Houghton reporting 3.8 inches, while at a number of stations in that area it was the earliest occurrence of snow in 50 years or more.

A few stations in the mountains of western Maryland reported a snow flurry on the 25th, the earliest occurrence of record for that district.

RELATIVE HUMIDITY

Over the States of the Atlantic coast the average percentages of relative humidity were very generally greater than normal, also over southern Texas, and in portions of the Lake region, thus outlining with considerable accuracy the regions with more than normal precipitation. At a few points in the far West there were also small areas where the humidity percentages were above the normal despite the general absence of appreciable precipitation. Elsewhere humidity precentages were practically everywhere materially less than normal, as would be expected due to the general absence of material precipitation. As a result of low humidity the fire hazard was greatly increased in the western forest areas, though fortunately no severe fires occurred.

CLOUDINESS AND SUNSHINE

The month was notably free over large areas from extensive periods of cloudiness, and sunshine prevailed to an unusual extent over most central and western districts. Along the Atlantic coast clouds prevailed to a considerable extent and the sunshine percentages were nearly everywhere less than normal.